

REMARKS

This Response is in reply to the final Office Action mailed on November 2, 2003. Claims 1, 2, 4-6, 8-13, 15 and 18 are pending, claims 1 and 11 having been amended herein. Claims 3, 7, 14, 16 and 17 were previously canceled without prejudice. No new matter has been added. Entry and consideration of the amendments and following remarks is respectfully requested.

Rejection under 35 U.S.C. §112

Claims 1, 2, 4-6, 8-13, 15 and 18 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. Claims 1 and 11 have been amended herein to correct improper antecedent basis. The Applicants respectfully traverse the Examiner's position on the rejections. Support for claims 1 and 11 is described throughout the specification and particularly on pages 15-16 of the specification. In view of the amendments to the claims it is submitted that the Examiner's rejections under 35 U.S.C. §112, second paragraph have been overcome.

Rejections under 35 U.S.C. 35 U.S.C. §103(a)

Claims 1, 2, 4-6, 8-13 and 15 and 18 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Koivukunnas et al. (5,438,920) in view of Schiel (5,226,357). The Examiner's rejections are respectfully traversed.

The claimed invention relates to a method for computing and regulating the distribution of linear load in a multi-nip calender and includes the step of assigning a value to at least one variable representing a physical property affecting the bending of each of the at least two intermediate rolls. The claimed invention also includes the steps of applying a first force to said at least two intermediate rolls by means of said variable-crown upper roll, applying a second force to said at least two intermediate rolls by means of said variable-crown lower roll and applying a support force to each one of said at least two intermediate rolls by means of said support cylinders. The claimed invention further includes the step of adjusting at least one of the following to place the set of rolls in a state of equilibrium and a predetermined state of deflection: the first force, the second force,

at least one of the support forces and at least one of the weight forces exerted on each of said at least two intermediate rolls.

The claimed invention according to independent claim 11 recites an arrangement for computing and regulating the distribution of linear load in a multi-nip calender that includes a variable-crown upper roll that applies a first force to at least two intermediate cylinders and a variable-crown lower roll that applies a second force to the at least two intermediate cylinders. The at least two intermediate rolls have support cylinders, the support cylinders apply a support force to each one of the at least two intermediate rolls. The set of rolls have bending lines which are curved downward. The arrangement also includes an automation system and a computing unit for assigning at least one value to a variable representing a physical property affecting the bending of each of the at least two intermediate rolls and for adjusting at least one of the following to place the set of rolls in a state of equilibrium and a predetermined state of deflection: the first force, the second force, at least one of the support forces and at least one of the weight forces exerted on each of the at least two intermediate rolls.

Koivukunnas et al. shows a method and apparatus, in which a web to be calendered is passed through nips formed by a variable-crown upper roll, a variable-crown lower roll, and by at least two intermediate rolls arranged between the upper and lower rolls. Such rolls are used as the intermediate rolls in which the form of the natural deflection line produced by their own gravity is substantially equal.

However, Koivukunnas does not teach or suggest an arrangement for computing and regulating the distribution of linear load in a multi-nip calender as recited in claim 1 of the claimed invention. Specifically, Koivukunnas et al. does not teach or suggest assigning a value to at least one variable representing a physical property affecting the bending of each of said at least two intermediate rolls as recited in independent claim 1 of the present invention. Nor does Koivukunnas et al. teach or suggest an automation system and a computing unit for assigning at least one value to a variable representing a physical property affecting the bending of each of said at least two intermediate rolls as recited in independent claim 11 of the present invention. Thus, Koivukunnas

et al. fails to teach or suggest the claimed invention as recited in claims 1 and 11.

Schiel ('357) shows a multi-roll calender, in which a sag-compensation roll is used as the bottom roll of the calender only (column 5, lines 5-7). The sag-compensation roll is of the type in which a sag thereof is compensated by an internal pressure, i.e there is a pressurized chamber in the roll. Conversely, the arrangement to which the present invention is directed includes a variable-crown upper roll that applies a first force to the at least two intermediate rolls and a variable-crown lower roll that applies a second force to the at least two intermediate rolls. In addition the method according to the present invention includes the step of adjusting at least one of the following to place the set of rolls in a state of equilibrium and a predetermined state of deflection: the first force, the second force, at least one of the support forces and at least one of the weight forces exerted on each of said at least two intermediate rolls.

Schiel does not disclose variable-crown upper roll that applies a first force to the at least two intermediate rolls and a variable-crown lower roll that applies a second force to the at least two intermediate rolls in the manner of the claimed invention. Furthermore, Schiel does not disclose adjusting at least one of the following to place the set of rolls in a state of equilibrium and a predetermined state of deflection: the first force, the second force, at least one of the support forces and at least one of the weight forces exerted on each of said at least two intermediate rolls in the manner of the claimed invention. Accordingly, Schiel fails to teach or suggest the claimed invention.

Even if the method and calender of Koivukunnas were modified so that a control computer with a complex program system as taught by Schiel were combined with it, the resulting combination would not lead to the method and calender of the present invention. Schiel (col. 4; line 43-50) teaches that "[i]n principle, the rolls which are arranged above the sag-compensation roll 2 have equal stiffness, in which case it must be ensured that the upper rolls differ in each case by less than 1.5 Nmm² with respect to their stiffness (stiffness = modulus of elasticity in N/mm² times moment of inertia in mm⁴). In accordance with one special embodiment, the stiffness of the rolls increases slightly in the downward direction."

The present invention does not have such limitations, but the stiffness and the deflection properties of the intermediate rolls may differ from each other in a desired manner. It is not possible to modify the control computer with a complex program system as taught by Schiel so that it could be used in the same way as the control system of the present claimed invention.

Thus, even if Schiel was combined with Koivukunnas et al., it would still fail to teach or suggest every feature of the claimed invention.

Accordingly, it is Applicants' contention that claims 1 and 11 of the present invention are not obvious and are therefore patentable over Koivukunnas in view of Schiel. By reason of their dependency on independent claims 1 and 11, the Applicants assert that claims 2, 4-6, 8-10, 12, 13, 15 and 18 are also patentable over Koivukunnas in view of Schiel. Therefore, it is respectfully requested that the obviousness rejections be withdrawn.

CONCLUSION

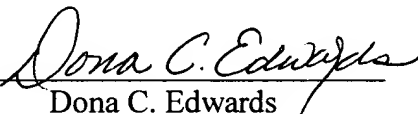
It is respectfully submitted, that in view of the amendments and remarks presented above, that the Examiners's rejection of the claims have been overcome and should be withdrawn.

Should any changes to the claims and/or specification be deemed necessary to place the application in condition for allowance, the Examiner is respectfully requested to contact the undersigned to discuss the same.

It is believed that this Response is being timely filed. In the event that any other fees are required, the U.S. Patent and Trademark Office is specifically authorized to charge such fee to Deposit Account No. 50-0518 in the name of Steinberg & Raskin, P.C.

An early and favorable action on the merits is earnestly solicited.

Respectfully submitted,
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